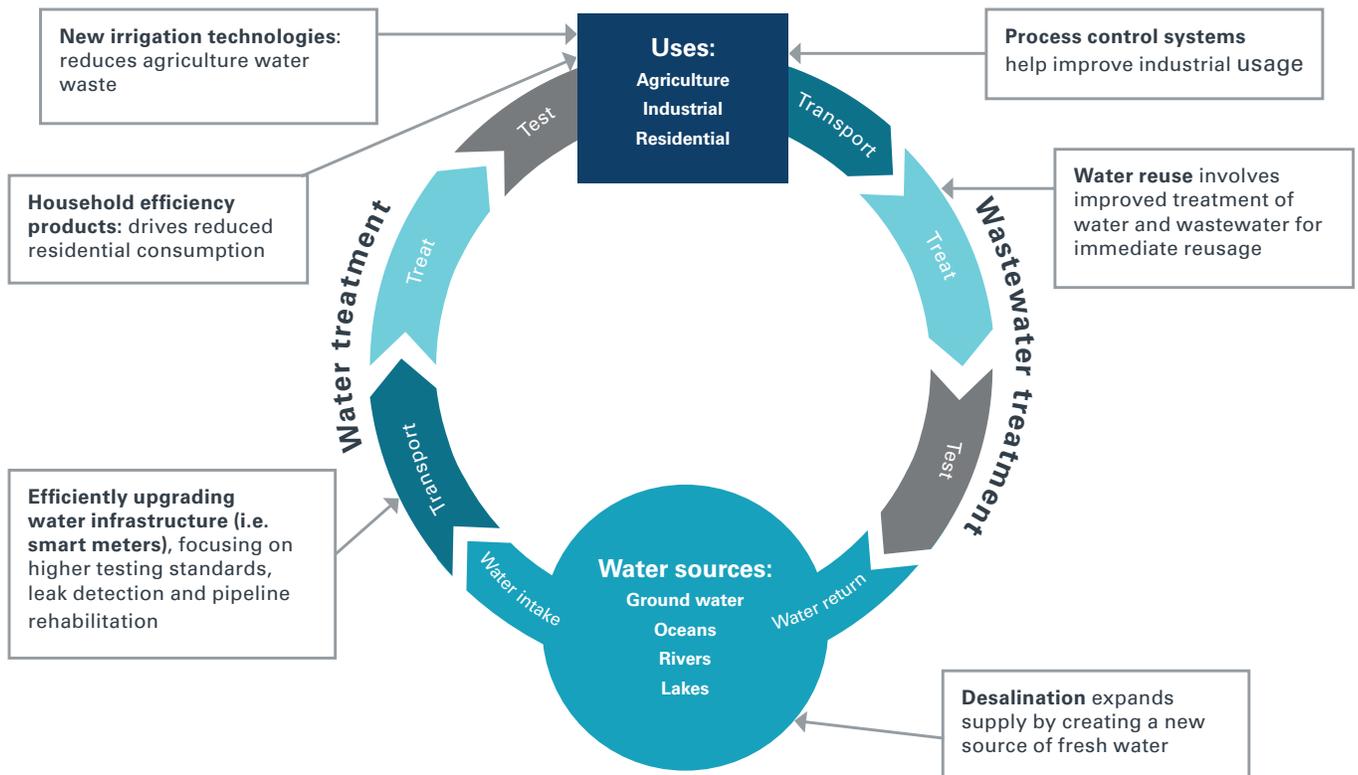


A deep dive into the water space

May 2018

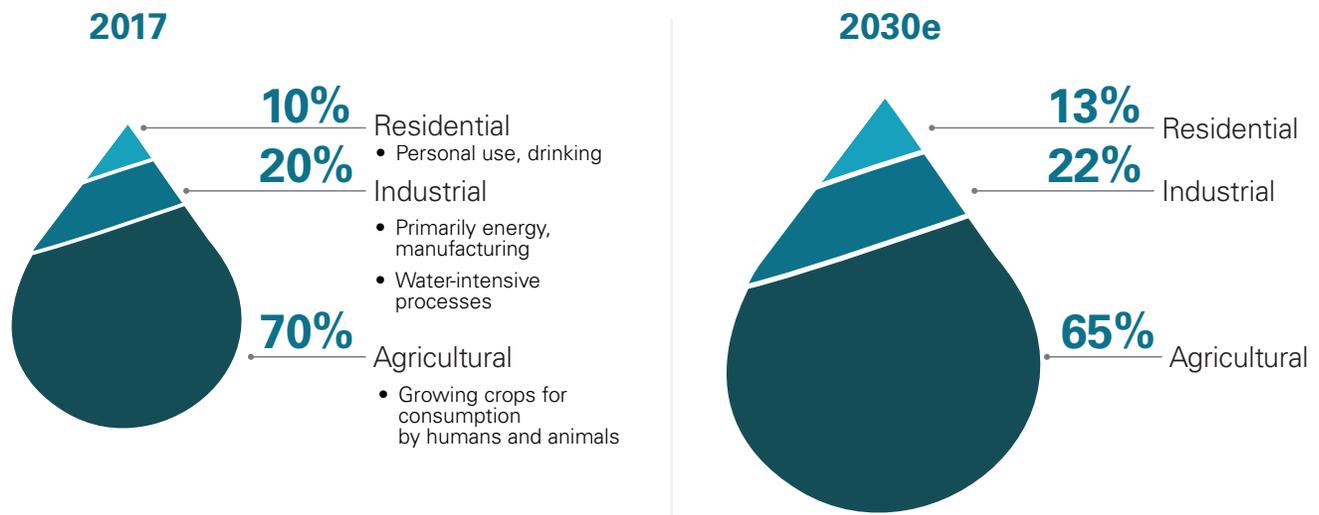
Introduction

Water is a life-sustaining resource with no substitute; humans, animals and plants alike all require water to survive. Water, and the infrastructure supporting it, has been a key source of sustenance for civilizations throughout history, from the ancient aqueducts in Rome to the elaborate infrastructure network we have today. While water covers the majority of the earth's surface, less than 1% of all water is readily available for consumption.¹ As such, and in our view, it is necessary to support efforts to ensure water is efficiently consumed and properly managed by investing in the companies that produce, manage, transport and treat this vital and finite resource.



People broadly view water consumption through the lens of direct individual use, for drinking, showering and watering their lawns, but personal consumption is actually a very small portion of world-wide water usage. Water is an input needed to sustain our food sources, generate the energy we consume and allow society to continue to generally function as it does today.

Global water demand breakdown



Source for water drop data: World Bank, January 2017. Water Resources Group, Citi GPS: Global Perspectives & Solutions (April 2017)

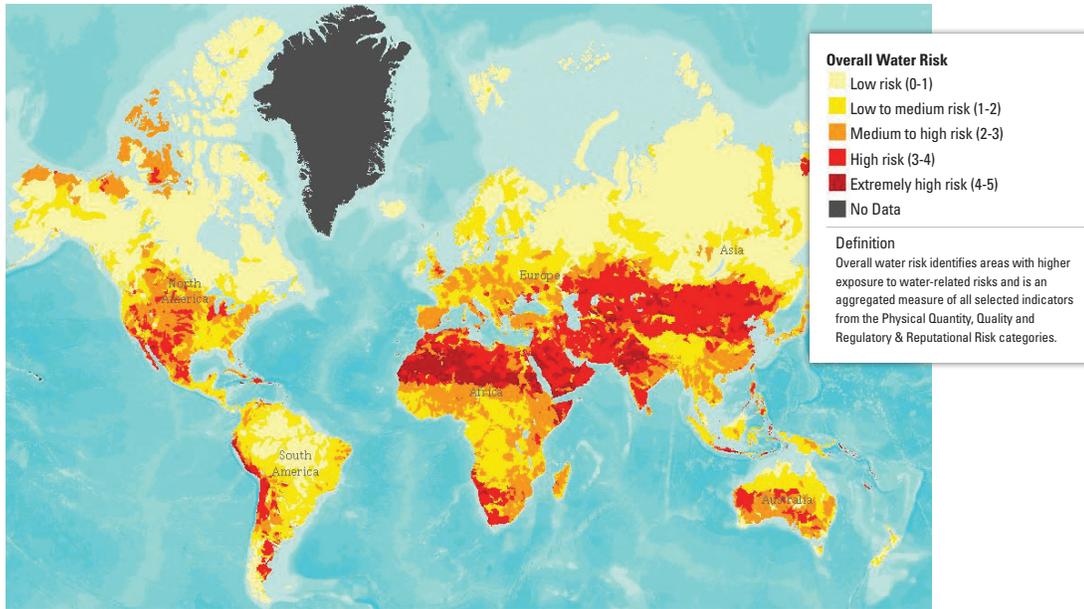
Water demand and usage is segmented into three categories: agricultural, industrial and residential. While the relative percentage of demand for each of these categories varies regionally based on the primary economic drivers of the locale, we believe the message remains clear – there is an insatiable demand for clean, usable water. To further illustrate this, the chart above shows the current overall breakdown of global water usage.

Global issues

Nations all over the world today face a host of water-related issues, which are predominantly centered on water stress and lack of infrastructure. The necessary and irreplaceable nature of water inherently results in scarcity. Historically, large scale civilizations could only develop near abundant sources of fresh, accessible water. As the population of the world continues to grow, we are seeing rapid depletion of traditional local water sources and population migration to areas without reliable water sources. An estimated 3.3 billion people live in areas that currently experience or are approaching states of physical or economic water scarcity, and it is projected that nearly half of the global population will be living in areas designated as high water stress by 2030.⁴ In addition to the scarcity of the actual resource, there is also a significant shortage of the infrastructure required to treat and distribute water. At least 1.8 billion people have no access to water clean enough for consumption and 2.4 billion people have no access to adequate sanitation.⁵

Water stress and lacking infrastructure are not just issues for emerging markets. They affect developed economies as well; an estimated 35% of the Organization for Economic Cooperation and Development's (OECD's) population lives in regions of "severe water stress"², which can be seen in the following map that illustrates water stress across the globe.

Despite the many obvious difficulties worldwide today, the problem will only continue to grow. The United Nations estimates that by 2050, global water demand will rise by more than 50%.⁶



Source: World Resources Institute – Aqueduct Project

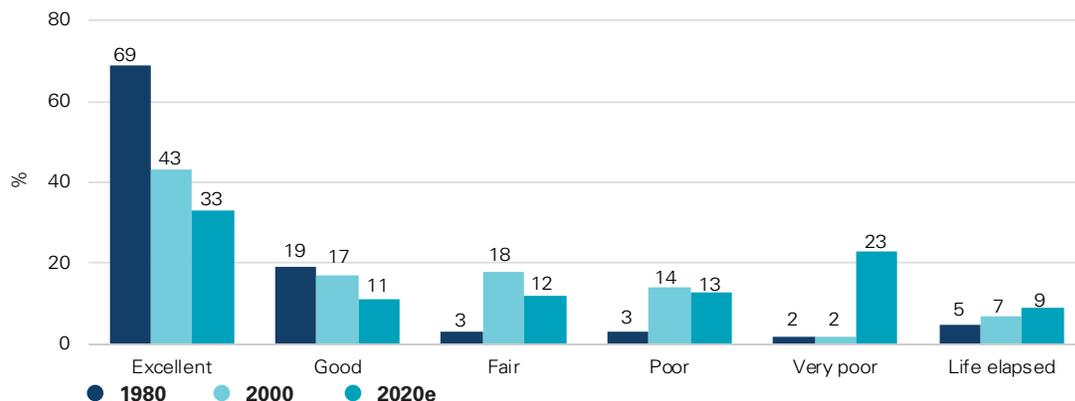
U.S. issues

As seen in the map above, water stress is a concern in many parts of the U.S.; however, we believe the most pressing concerns in the U.S. are centered on aging and inadequate infrastructure — replacing outdated infrastructure, building new infrastructure and securing the financing to do so. According to the American Water Works Association, restoring existing water systems and building new infrastructure in the U.S. will cost at least \$1 trillion over the next 25 years. Through 2050, those costs escalate to \$1.7 trillion or \$30 billion annually.⁷

A significant portion of existing water and waste water infrastructure in major U.S. cities was rapidly constructed between 1950 and 1970. Large urban centers in the Northeast, such as New York and Boston, have infrastructure that dates back to the 1800’s. With useful lives ranging from 15 to 95 years⁸, much of our drinking water infrastructure is approaching or has already exceeded its useful life. It is estimated that by 2020, 45% of all water and wastewater infrastructure in the U.S. will be past its useful life or in poor/very poor condition.⁹ As displayed in the charts below, the deterioration of the U.S. water pipeline system has been material enough that the American Society of Civil Engineers scored our water infrastructure with a letter grade of D.

The need for new infrastructure build-out is largely driven by normal population growth as well as population migration. Due to the concentration of the U.S. population in major cities on the east coast, less than 10% of existing water systems provide water to more than 80% of the U.S. population⁸. The remaining 90% of water systems serve smaller, rural communities. America’s population, while urbanizing, is generally relocating from

Condition of U.S. water infrastructure



Source: U.S. Environmental Protection Agency, The Clean Water and Drinking Water Infrastructure Gap Analysis (September 2002).

traditional, large urban centers in the East where extensive water infrastructure networks (albeit aging) already exist, to new areas in the southern and western parts of the country where existing water infrastructure is stressed by the rapid growth in population. This rapid growth in population has and continues to create the need for new water infrastructure development in those areas.

The increasing financial burden of replacing aging infrastructure and building new infrastructure comes at a time when state and municipal budgets—historically the primary funders of such projects—are running serious deficits. Total state budget shortfalls nearly doubled after the financial crisis, and though recovering, those shortfalls are still large relative to historical standards. To address these gaps, states tend to cut spending rather than raise tax revenue. In addition to traditionally providing funding for water infrastructure, states and municipalities typically own the water systems. Approximately 87% of the U.S. population is serviced by a public drinking water system and 79% by a public sewer connection.¹⁰ Only 5% of existing water systems are in private hands.¹⁰ With state/municipal balance sheets under financial stress, non-governmental investment is expected to play a significant role in meeting financing needs.

Key growth drivers

There are six major growth drivers that we believe will play a significant role in the evolution of the water industry:

1. **Supply/Demand imbalances:** historically reliable water sources are being used faster than they are being replenished, and the location of water resources does not always coincide with the sources of demand, resulting in supply shortages.
2. **Enormous capex investment required to address dramatically deteriorating or lacking infrastructure:** bringing existing infrastructure back up to reasonable quality standards and building new infrastructure in areas that are experiencing significant population growth requires high levels of capex investment.
3. **Shift of investment source from public to private sector:** public entities such as municipalities, states and the federal government have historically owned, operated and maintained water systems. However, with public finances under stress, private (non-governmental) investment will be required to provide the desperately needed capital that will stabilize our water infrastructure.
4. **Rising water prices:** since the 1980s, water prices have actually risen more than crude oil prices and they have done so on a much less volatile path. Despite this, water prices remain well below where they need to be to adequately maintain our infrastructure costs. We believe that the increasing need to replace and build infrastructure may drive water prices higher, increasing the attractiveness of private investment.
5. **Technology improvements:** a vast array of new technologies are entering the market that make water distribution, treatment and use more efficient and make new resources available for human consumption. Many of these technologies will benefit from new infrastructure build-out and others can be applied to help expand our potential water supply or utilize our existing supply more efficiently.
6. **Regulatory and political environment:** regulations and policies have had an intensified focus on encouraging both infrastructure and technology improvement and we expect this favorable regulatory climate to continue and potentially become a driver for the industry.

Investment Opportunity

While water related issues have become increasingly critical, we believe the ongoing need for water creates a unique opportunity for investors. Access to clean, fresh water may seem like a given to most people living in the U.S. However, as can be attested to by residents of water-stressed California or Flint, Michigan, access to clean, fresh water should not be taken for granted. The problem is often perpetuated by the governing body's reluctance to sufficiently raise water prices to allow them to operate, manage, update and maintain existing water resources efficiently. It must also be funded in a way that accurately reflects the fundamental costs involved. In our view, the numbers speak for themselves and illustrate an opportunity that will not only benefit the country as whole, but also investors looking to participate in a sector well-positioned for growth.

About Tortoise

Tortoise specializes in essential assets and income investing. Essential assets serve critical needs in society while also providing essential needs in client portfolios, such as diversification and income. Through a variety of investment vehicles, Tortoise offers a wide range of solutions, focused on clients' evolving needs. For more information, please visit www.tortoiseadvisors.com.

¹ U.S. Department of the Interior, U.S. Geological Survey, December 2016

² Bank of America Merrill Lynch, *Blue Revolution*, April 2014

³ savethewater.org, 2017

⁴ United Nations Department of Economic and Social Affairs

⁵ United Nations World Water Development Report, 2016

⁶ United Nations World Water Development Report, 2015

⁷ American Water Works Association, *Buried No Longer*

⁸ American Society of Civil Engineers, *Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future*

⁹ United States Environmental Protection Agency

¹⁰ Suez Environment, Education Day Focus on Suez Environment Regulated Businesses

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